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Surface-modified mixed oxides containing noble metal and titanium, for the selective oxidation of hydrocarbons

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This invention relates to a process for the production of a composition containing gold and/or silver particles, mixed oxides containing titanium and silicon which have been surface-modified, to the compositions producible in this process and to the use thereof in processes for the selective oxidation of hydrocarbons in the presence of oxygen and a reducing agent. The catalytically active compositions exhibit constantly high selectivities and productivities.

The direct oxidation of ethene to yield ethene oxide by molecular oxygen is well known and is used for the commercial production of ethene oxide in the gas phase. The typical catalyst for this application contains metallic or ionic silver, possibly additionally modified with various promoters and activators. Most such catalysts contain a porous, inert catalyst support having a small surface area, such as for example alpha-aluminium oxide, onto which the silver and promoters have been applied. A review of the direct oxidation of ethene in the presence of supported silver catalysts has been compiled by Sachtler *et al.* in *Catalysis Reviews: Science & Engineering*, 23 (1&2), 127-149 (1981).

It is also known that these silver catalysts and the reaction conditions which have proved favourable for ethene oxide production do not give rise to comparably good results in the direct oxidation of higher olefins, such as propene (US 5 763 630, US 5 703 254, US 5 760 254) and propene oxide selectivities of at most approx. 50% are achieved. In general, direct oxidation reactions of these higher olefins with molecular oxygen do not generally proceed in the gas phase at below 200°C, even in the presence of catalysts, and the selective production of oxidation products sensitive to oxidation, such as epoxides, is thus difficult as the consecutive reactions of these products frequently proceed more rapidly than the oxidation of the introduced olefins themselves. Another problem arises from the sensitivity to oxidation of the allyl groups present in higher olefins.